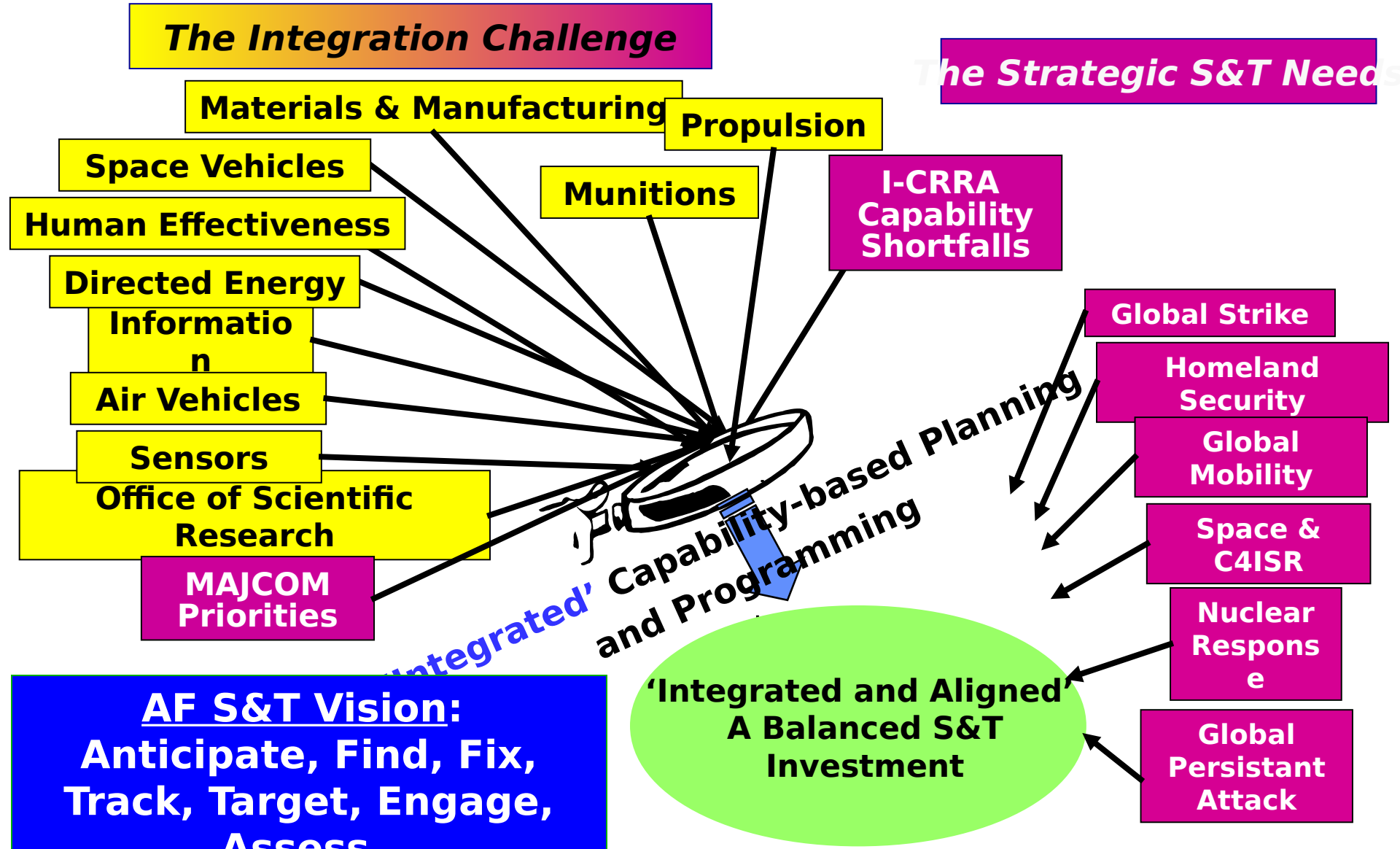
Focused Long Term Challenges (FLTCs)

Integrated Capability Planning Process Status Update

21 April 2006

AFRL
THE AIR FORCE RESEARCH LABORATORY
LEAD | DISCOVER | DEVELOP | DELIVER

S&T Integrated Investment Development is a Challenge!

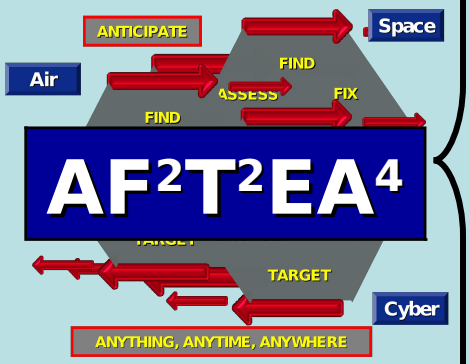


Focused Long Term Challenges

Delivering the Air Force S&T Vision Through Leadership, Discovery, Innovation, and Inte

1. **Anticipatory Command, Control & Intelligence (C2I)**
2. **Unprecedented Proactive Surveillance & Reconnaissance (S&R)**
3. **Dominant Difficult Surface Target Engagement/Defeat**
4. **Persistent & Responsive Precision Engagement**
5. **Assured Operations in High Threat Environments**
6. **Dominant Offensive Cyber Engagement**
7. **On-demand Theater Force Projection, Anywhere**

FLTC Taxonomy



FLTC 1

Problem Statement 1

Problem Statement N

FLTC 8

AF Approved

AFMC Configuration Managed

Mid-Term Attribute 1

Mid-Term Attribute M

Long-term Attribute

AFRL Configuration Controlled

Product 1

Product L

Product 1

Product J

Discovery Challenge Thrust(s)

Fundamental Research Thrust(s)

Project 1

Project K

Vision / *BHAGs* / *Problems* / *Tech Challenges* / *Approaches*

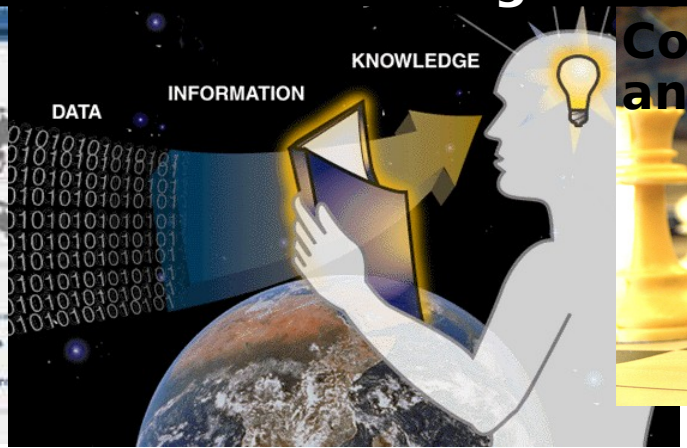
FLTC #1 Anticipatory Command, Control & Intelligence (C2I)

Anticipate Enemy Actions and Respond with Synchronized Management of Battlespace Effects

- Find Threatening Systems & Objects
- Predict Adversary Behaviors
- Perform Near-Real Time Decision Management
- Assure Fully Effective C2 Operators

Building

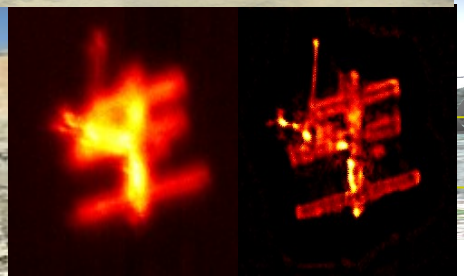
Understanding



Strategizing

FLTC #2 Unprecedented Proactive Surveillance &

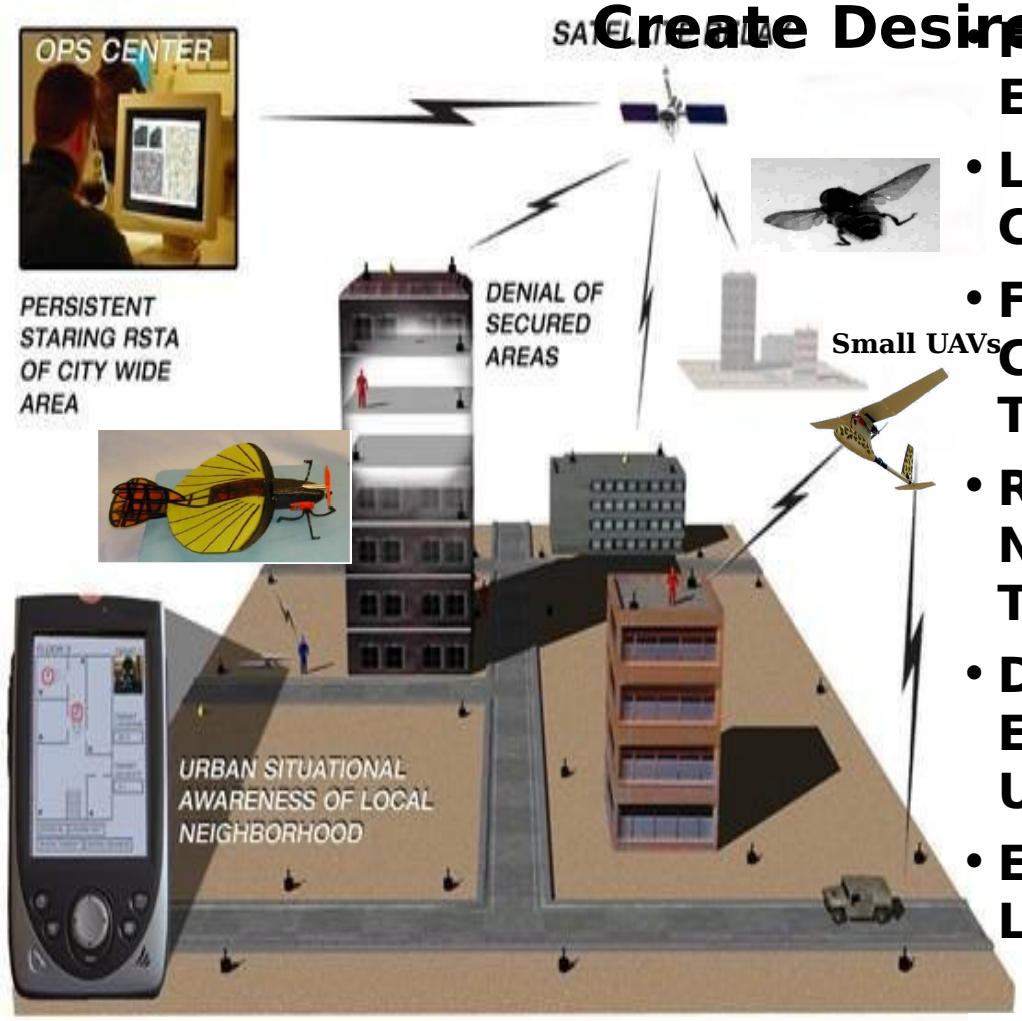
Proactively Find, Fix, and Track Anything, Anytime, Anywhere with Agile and Immediate C4ISR



- Enable High Performance Networks for Assured C2 and Sensing
- Persistently Deliver Fused Multi-Source S&R for Total Battlespace Awareness
- Assure Closed-Loop C2ISR Sensing and Processing (anticipatory)
- Generate Wide-Area, Global Access, Detection and Tracking
- Deliver High-Volume, Super Resolution Imagery of Anywhere, Anytime
- Assure All-Object Space Situational Awareness

FLTC #3 Dominant Difficult Surface Target

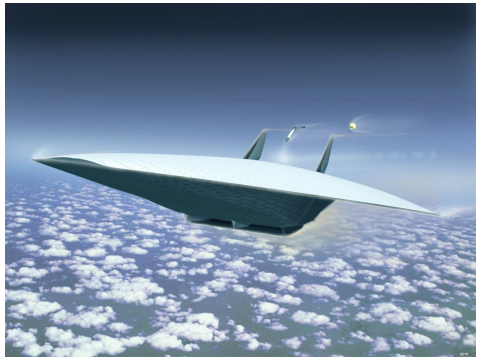
Detect, Tag, Track, Identify, Target Adversaries, IEDs, CBRNE in Congested or Concealed Environments and Create Desired Effects

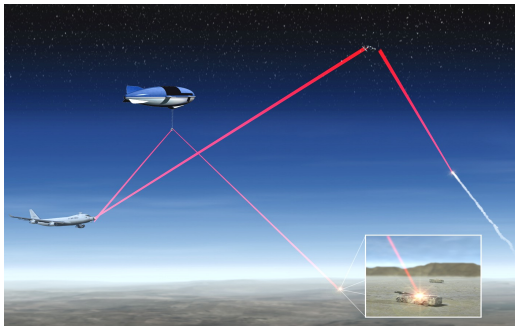


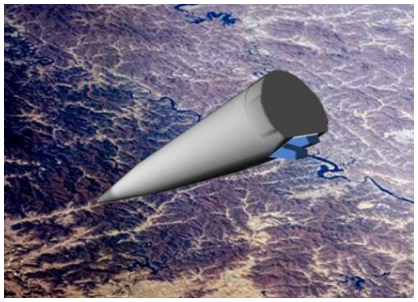
- Find, ID, Assure-Tracking and Engage Adversaries & IEDs
- Locate, ID, Engage and Neutralize CBRNE
- F2T2 Difficult Targets Including Complex Urban and Difficult Terrains
- Rapidly Deliver Scalable Kinetic & Non-Kinetic Effects to Difficult Targets
- Deliver On-Demand, Lethal Effects to Difficult Targets with Ultra Precision
- Engage Adversaries with Non-Lethal Force

FLTC #4 Persistent & Responsive Precision Engagement

Maneuver Through Anti-Access/Area Denied Environments to Deliver Effects Rapidly and/or Persistently





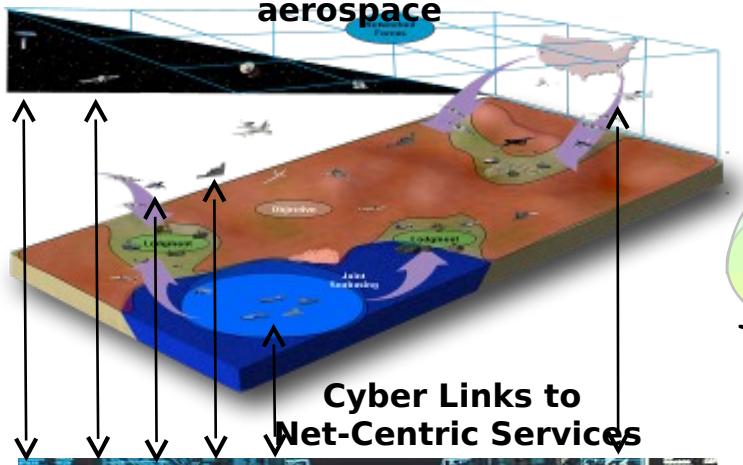


- **Globally Deliver Directed Energy and Non-kinetic Effects**
- **Globally Deliver Full Spectrum of Kinetic Effects**
- **Globally Deliver Selected Effects for Time Critical Targets**
- **Covertly Globally Deliver Autonomous, Unattended Sensor Payloads**

FLTC #5 Assured Operations in High Threat Environments

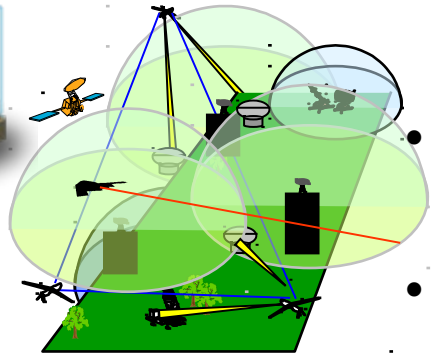
Achieve Mission Objectives With Impunity Against Full Spectrum Threats, from Anti-Access IADS to Cyber

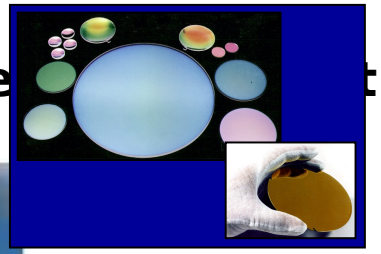
Assured operations in aerospace

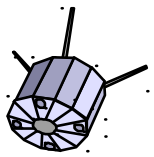


Cyber Links to Net-Centric Services

Protection in the cyber domain



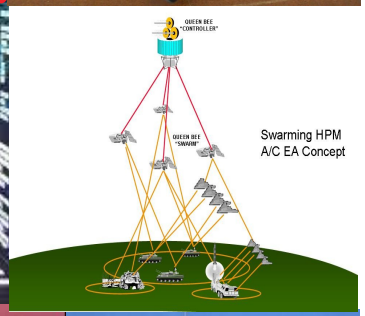


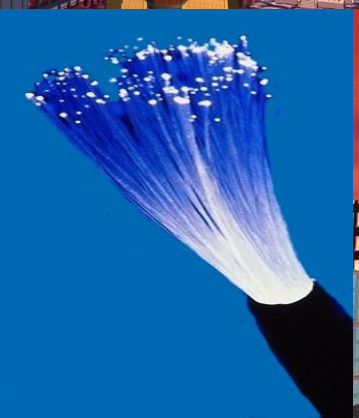


- Anticipate and Avoid Threat Through Stealth and Deception
- Detect and Defeat Threats Through Active Defenses
- Survive the Attack Through Passive and Adaptive Protection
- Recove[illegible]t Effects

FLTC #6 Dominant Offensive Cyber Engagement

Conduct full spectrum offensive cyber/info ops against military, leadership, and infrastructure

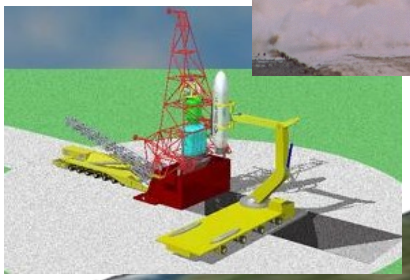




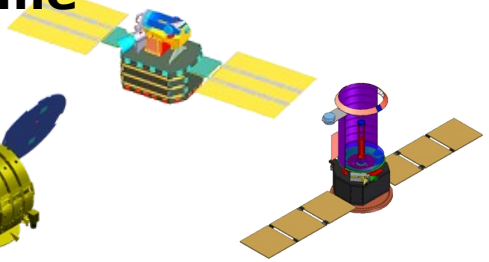
- Access Adversary's Cyber/Info Systems Anywhere, Anytime
- Operate with Stealth and Persistence in Cyber
- Generate Robust Cyber Intelligence (CYBINT)
- Deliver Integrated D5 Information Operations Effects
- Deliver Counter Electronics Effects

FLTC #7 On-demand Theater Force Projection, Anywhere

Responsive Deployment of Flexible Ground, Information & Space Capabilities for the Theater Commander

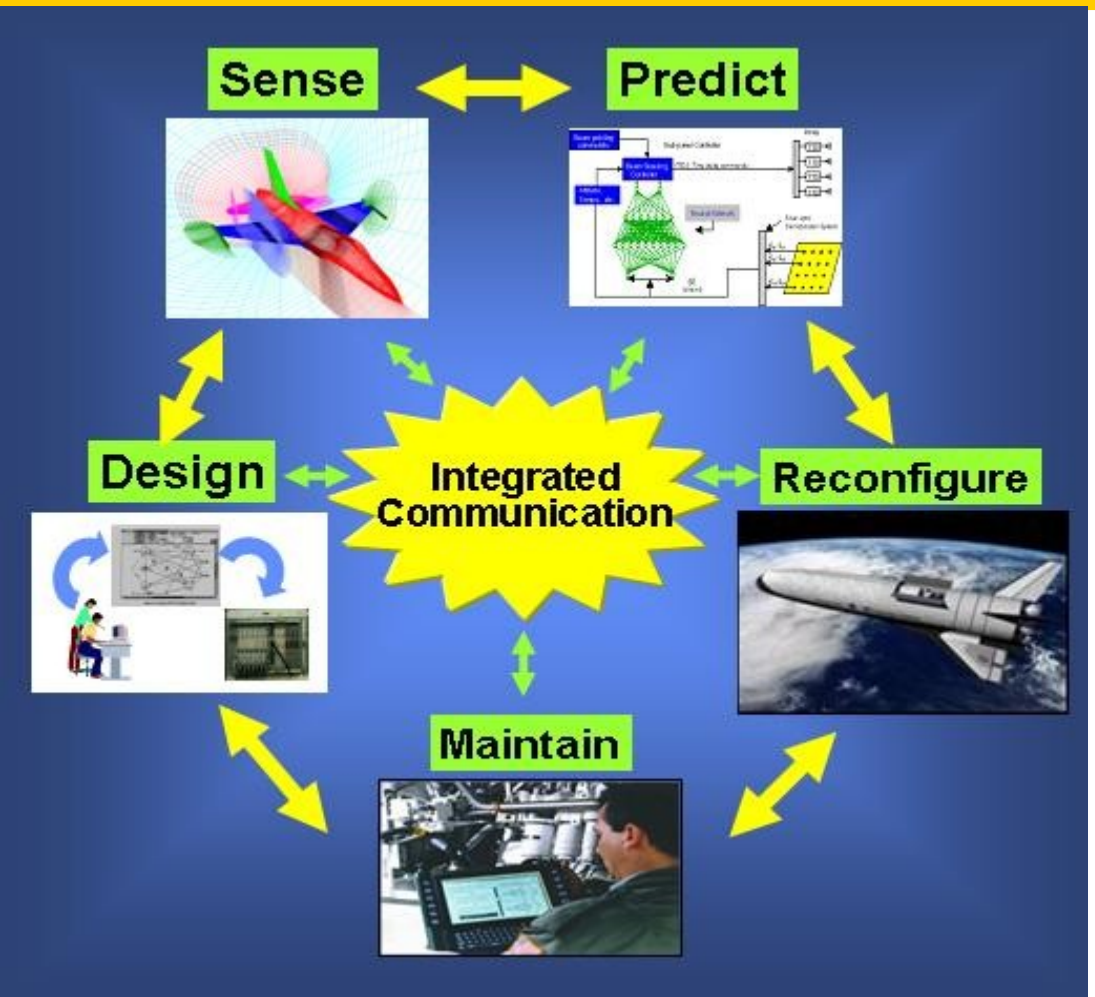


- Rapidly Constitute Multi-Mission, Affordable Small Satellites
- Rapidly Deploy Multi-Mission, Affordable Space Payloads
- Generate On-Demand, Reusable Affordable Space Access
- Rapidly Checkout Spacecraft and Autonomous Operations
- Globally Project Ground Forces Anywhere in All Weather
- Globally Move, Manage, And Process Information In Real-time



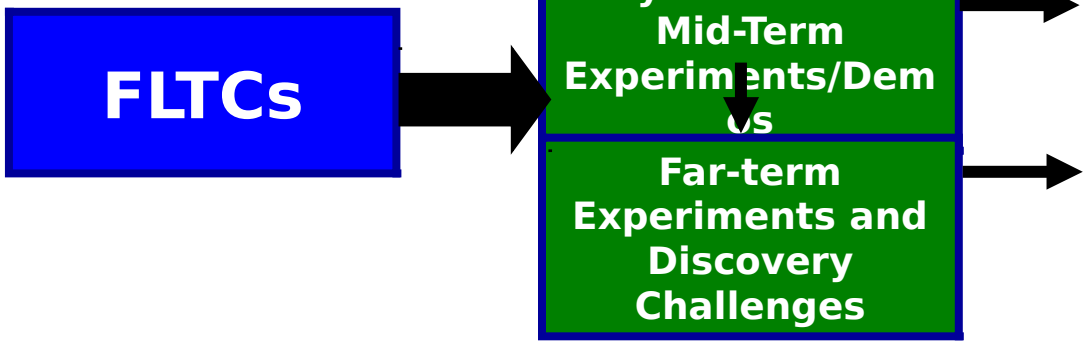
FLTC #8: Affordable Mission Generation & Sustainment

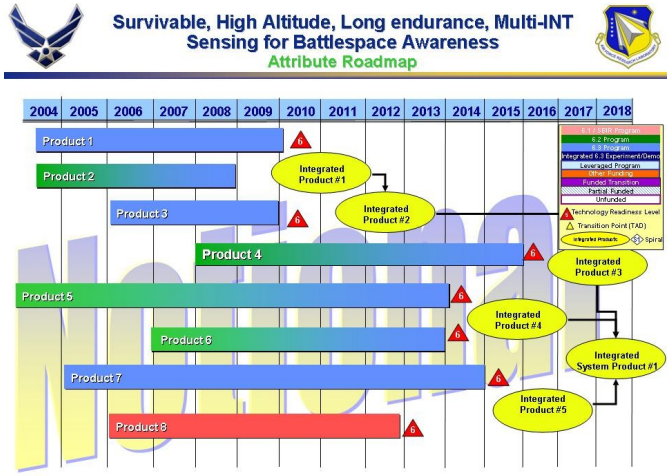
Maximize Mission Capability and Attack O&S Costs by Embedding Robust Reliability and Predictable Readiness



- Provide Real-time Total Weapon System Health Status
- Predict Any System's Mission Capability
- Autonomically Reconfigure Systems for Any Damage Condition
- Proactively Maintain Readiness
- Design for Integrated System Life Cycle Management & Intrinsic

FLTC Process/Deliverables

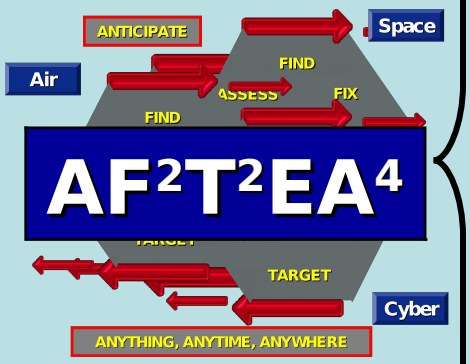




- **Process Deliverables**
  - **FLTC Problem Statement and Technology Challenge Baseline**
  - **Capability taxonomies defined to project level**
  - **Capability evolution expressed as attributes vs. time**
  - **Mid-term capability experiments/demonstrations & product roadmaps**
  - **Capabilities defined using Attribute & Product quad charts**

Will highlight the whole set using FLTC #2

FLTC Taxonomy



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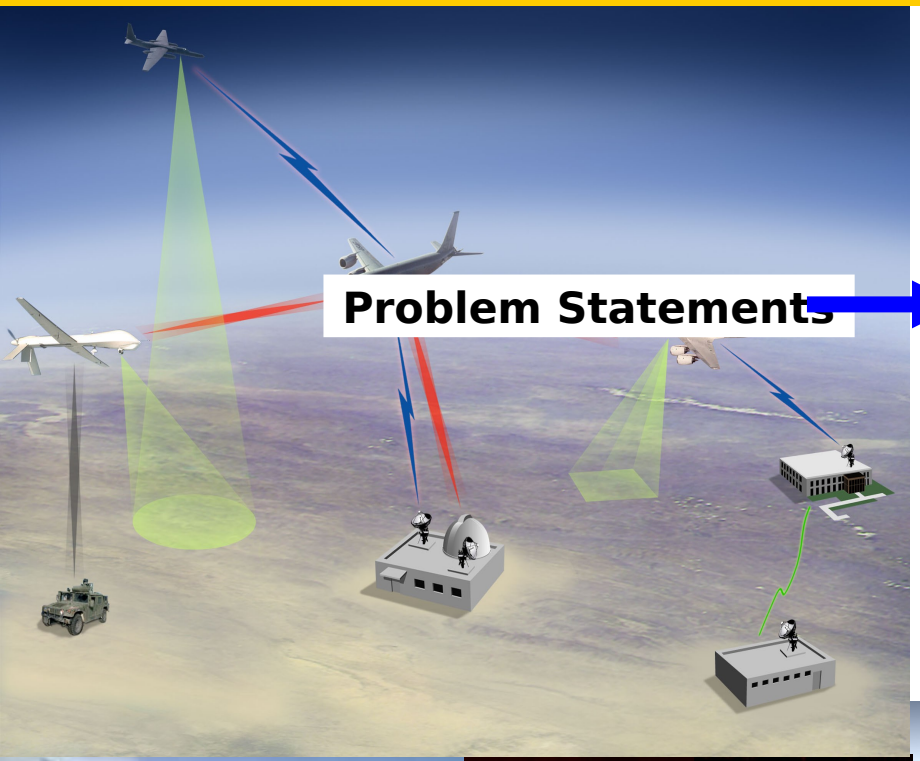

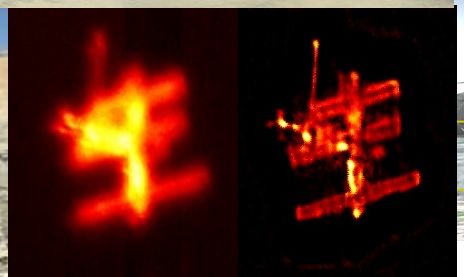

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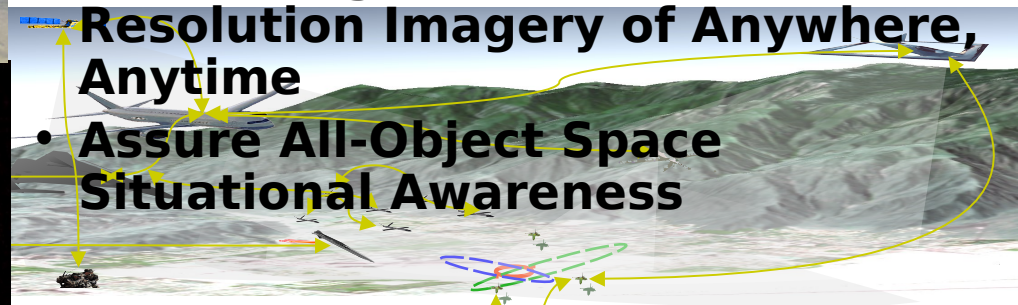


FLTC #2: Unprecedented Proactive S&R
Problem Statement Forecast

Limited

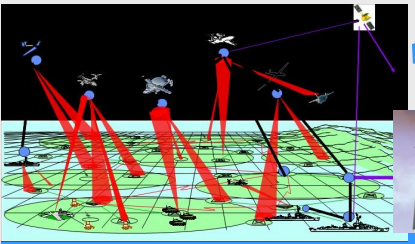
- Limited Network, X Gbps LOS, X Gbps Reachback, Secure
- X hours of endurance
- Multi-INT cross-cued
- On-board data fusion
- Track vehicles / air-sea-craft with human assistance, 24/7
- Tipoffs of significant events anywhere
- X foot resolution imagery
- “Draft Quality” structure > X meter deep
- Automatically cross-cue, humans
- Find and Fix small space objects - GEO
- Non-eclipse neighborhood watch LEO/GEO
- Find difficult space objects – new EO phenomenology

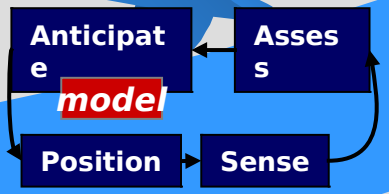
Moderate

- Semi-Adhoc network, 2X Gbps LOS, 4X Gbps Reachback, Secure
- X+ hours endurance
- Multi-INT+ Cross-cued and fused
- Conformal structural apertures
- Automatically track vehicles / air-sea-craft
- Sufficient space / time accuracy for sensor pointing
- X foot resolution imagery anywhere within X minutes, 10X images per hour
- Automatically detect adversaries, ID vehicles
- “Architect Quality” structure > X meter deep
- Find and Fix small space objects - LEO
- Precision track of small objects – GEO
- Non-eclipse neighborhood watch at LEO and GEO

Full

- Adhoc Network, 4X Gbps LOS, 10X Gbps Reachback, Secure
- 2X hours endurance
- Long duration spatial/temporal multi-source patterns (predictive)
- X inch resolution imagery X min, 10X/hr
- “Civil Engineer Quality” structure > X meter deep
- Exploitation of various wideband radar pulses
- Molecular RF components
- Integrated, on-demand sensor capability for wide FOV search
- Sensors with ultra-high dynamic range and sensitivity
- Advanced phenomenology models of space objects





Near Term (2010)

Mid Term (2015)

Far Term (2025)

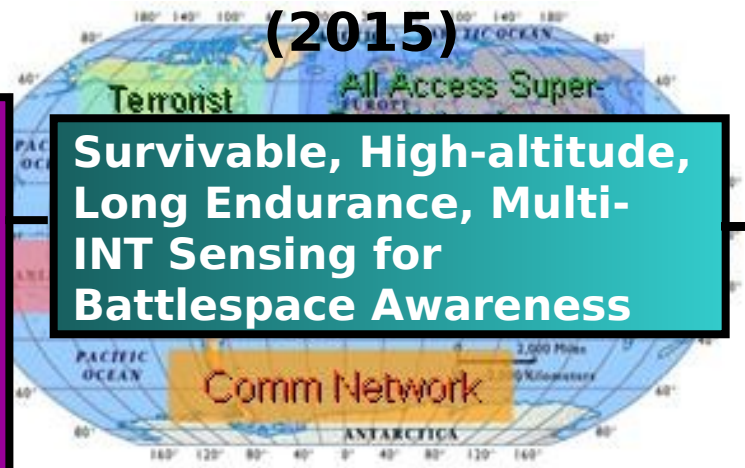
FLTC 2.2 Decomposition

Problem 2.2

Persistently Deliver Fused Multi-Source ISR for Total Battlespace Awareness

Mid-term Attribute – 2.2.1 (2015)

Survivable, High-altitude, Long Endurance, Multi-INT Sensing for Battlespace Awareness



Products

- 2.2.1.1 Efficient Aero/Structure for HALE UAV (VA)
- 2.2.1.2 Structural X-band Array (VA)
- 2.2.1.3 Multi-INT Sensors Persistent ISR (SN)
- 2.2.1.4 Structural Low-Band Antenna (VA)
- 2.2.1.5 Highly Efficient Embedded Turbine Engine (PR)
- 2.2.1.6 Power and Thermal Management for HALE UAV(PR)
- 7.5.1.4 Large Diameter Fan Inlet Integration
- 5.2.1.1 Self Defense Weapon for A/C-Laser
- 7.3.1.6 ISHM for RLVs (architecture)

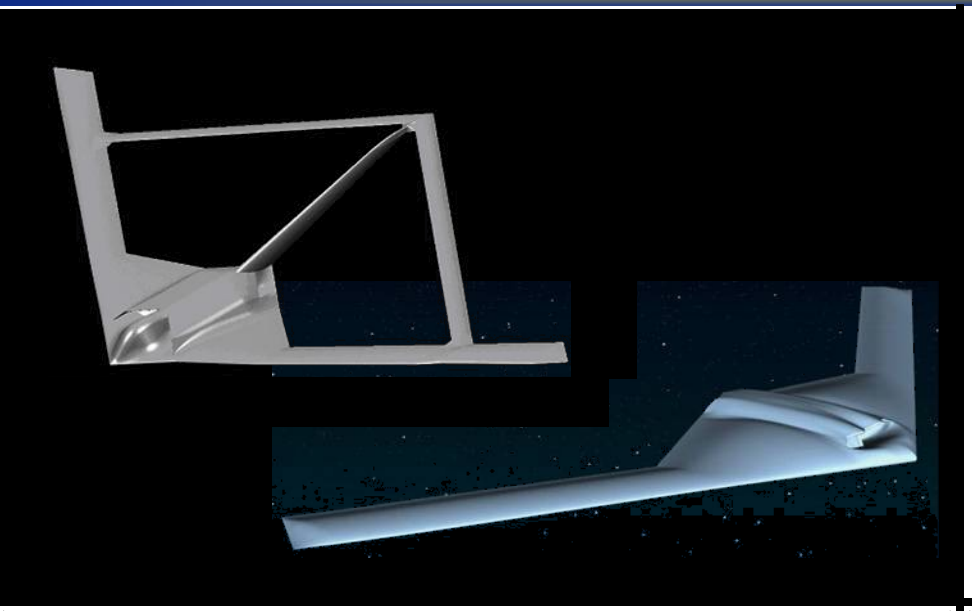
FLTC Products

Other FLTC Products

Partner Programs

Taxonomy Breakdown Example

Survivable, High-altitude, Long Endurance, Multi-INT Sensing for Battlespace Awarenes



Future Operational Capability Visio

- Full spectrum battlefield awareness in a medium threat environment
- Fused data delivered to battlefield and theater commanders
- Ability to find and track hidden mobile targets
- Space-like sensor data generated

Current Capability

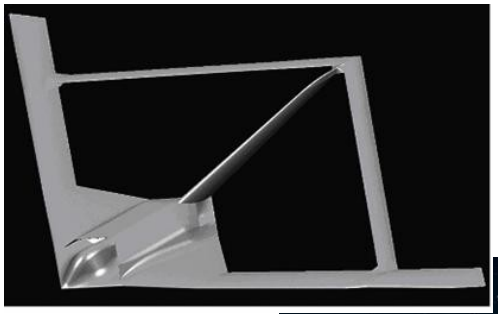
- X hours endurance
- Independent Sensor Suite
- Side Looking Coverage
- Raw data to mission control element (MCE)
- Conventional apertures
- Conventional, standard length wings
- Standoff asset

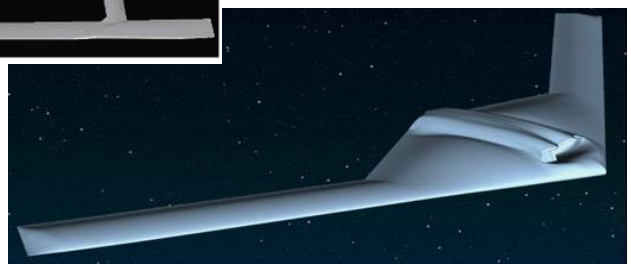
Mid Term Demonstration (2013)

- X+ hours endurance
- Cross-Cued Sensor Suite
- Complete Coverage
- Fused data to user
- Conformal structural apertures
- Active, extended length wings
- Penetrating asset

Efficient Aero/Structure for HALE UAV

Vision – Technology Challenges - Demonstration





Far Term Vision

- ***Long Range Persistence***
- ***Bridged Gap between ISR and Strike***
- ***Increased Area Coverage***
- ***Increased Resolution***

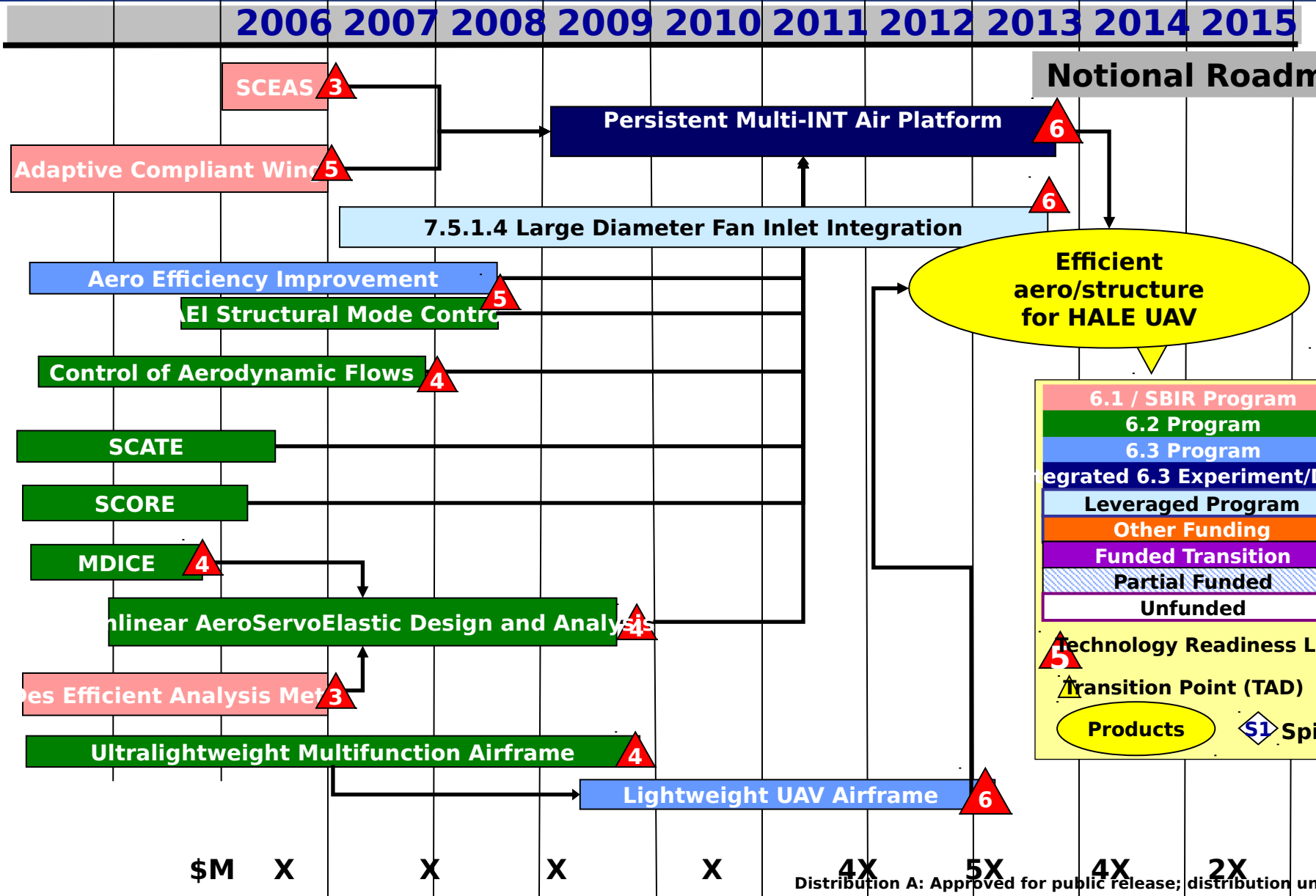
Technology Challenges

- **Extending Laminar Flow on Highly Flexible, Swept Wings**
- **Deformation Compensation for Large Structurally Integrated Arrays**
- **Body Flutter Suppression**
- **Drag Minimization**

Mid Term Demonstration (2008-2013)

Aerodynamic efficiency and aeroelastic stability needed to support long-range persistence of multi-INT sensor suites

2.2.1.1 Efficient Aero/Structure for HALE UAV



Way Forward

- **Institutionalizing the FLTC process across AFRL, AFMC, AF, Partners and Customers**

- **For DoD Agencies and DoD Contractors: More Detail Information will be available Summer of 2006**

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